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EXAMINER

ANDUJAR, LEONARDO

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 07/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/783,034

Applicant(s)

KHAN ET AL.

Examiner

Leonardo Andújar

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 26 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 52 and 53 is/are allowed.
- 6) ☒ Claim(s) 1-17, 19-23 and 25-51 is/are rejected.
- 7) ☒ Claim(s) 18 and 24 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

  
NATHAN J. FLYNN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4-6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Acknowledgment***

1. The amendment filed on 06/26/2002, paper no. 8, in response to the Office action mailed on 03/26/2002 has been entered. The present Office action is made with all the suggested amendments being fully considered. Accordingly, pending in this Office action are claims 1-53.

### ***Information Disclosure Statement***

2. The information disclosure statement filed 06/26/2002 (paper no. 7) fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each U.S. and foreign patent; each publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. In this case, none of the cited references were received. It has been placed in the application file, but the information referred to therein has not been considered.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 41 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 41 recites the limitation "said second surface of said stiffener" in line 3. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-3, 5, 9, 10, 12-14, 16-19, 25-27, 29-31, 33-42 and 45-47 are rejected under 35 U.S.C. 102(e) as being anticipated by Lin (US 6,184,580).

8. Regarding claim 1, Lin (e.g. fig. 3) shows a ball grid array package comprising:

- A stiffener 26 attached to the first substrate surface;
- A substrate 35 that has a first surface 31, a second surface 33, and a central window shaped aperture that extends through the surfaces;
- A portion of the stiffener that is accessible through the central window-shaped aperture;
- An IC die 20 that has a first surface 24 and a second surface 21, wherein the first IC die surface is mounted to the accessible portion of the stiffener;
- And a heat spreader 42 that has a surface 43 that is mounted to the second IC die surface.

9. Regarding claim 2, Lin shows a plurality of solder balls attached to the second substrate surface.

10. Regarding claim 3, Lin shows that the spreader is configured to dissipate heat generated by the IC die (col. 5/ll. 14).

11. Regarding claim 5, Lin shows that the second heat spreader surface 47 is attached to a printed circuit board 60 (e.g. fig. 4).

12. Regarding claim 9, Lin shows that the stiffener includes a central cavity. The central cavity forms part of the accessible portion of the stiffener/heat spreader. Also, the IC die is mounted on the central cavity.

13. Regarding claim 10, Lin shows that the stiffener is substantially planar. Also, the stiffener accessible portion is centrally located on the stiffener surface.

14. Regarding claim 12, Lin shows that the second die surface is greater than an area of a surface of the heat spreader 43. Also, Lin shows that the heat spreader is centrally mounted on the second IC die surface.

15. Regarding claim 13, Lin shows that the mold 28 encapsulates the heat spreader.

16. Regarding claim 14, Lin shows that the mold 28 encapsulates the heat spreader. Also, Lin shows that an exposed second surface 47.

17. Regarding claim 16, Lin suggests the use of a tape substrate (col. 6/ll.24)

18. Regarding claim 17, Lin discloses that the stiffener and the heat spreader can be made from the same material (col. 6/lls. 25-26). Therefore, Lin teaches that the stiffener and the heat spreader have the same thermal expansion coefficient.

19. Regarding claim 18, the device of claim 1 would necessarily have to be formed in order to function. Claim 18 fails to further limit the device of claim 1 other than simply form each of their component.

20. Regarding claim 19, the device of claim 2 would necessary have to be formed in order to function. Claim 19 fails to further limit the device of claim 2 other than simply form each of their component.

21. Regarding claims 25 and 26, the device of claim 9 would necessary have to be formed in order to function. Claims 25 and 26 fail to further limit the device of claim 9 other than simply form each of their components.

22. Regarding claim 27, the device of claim 10 would necessary have to be formed in order to function. Claim 27 fails to further limit the device of claim 10 other than simply form each of their component.

23. Regarding claim 29, the device of claim 12 would necessary have to be formed in order to function. Claim 29 fails to further limit the device of claim 12 other than simply form each of their component.

24. Regarding claim 30, the device of claim 13 would necessary have to be formed in order to function. Claim 30 fails to further limit the device of claim 13 other than simply form each of their component.

25. Regarding claim 31, the device of claim 14 would necessary have to be formed in order to function. Claim 31 fails to further limit the device of claim 14 other than simply form each of their component.

26. Regarding claim 33, the device of claim 16 would necessary have to be formed in order to function. Claim 33 fails to further limit the device of claim 16 other than simply form each of their component.

27. Regarding claim 34, the device of claim 17 would necessary have to be formed in order to function. Claim 34 fails to further limit the device of claim 17 other than simply form each of their component.

28. Regarding claim 35, Lin (e.g. fig 3) shows a system for assembling a ball grid array package:

- A substrate 35 that has a first surface 31, a second surface 33, and a central window shaped aperture that extends through the surfaces;
- A stiffener 26;
- Means 38 for attaching a surface of the stiffener to the first substrate;
- Means for mounting a first surface of an IC die 20 to the accessible portion of the stiffener (col. 4/lis. 4-5);
- And means 28 for mounting a surface of a heat spreader 42 to a second surface of the IC die 21.

29. Regarding claim 36, Lin suggests the use of a tape substrate (col. 6/l.24). Also, Lin discloses a means 40 for providing a substrate

30. Regarding claim 37, Lin discloses that the heat spreader comprises a metal (col. 6/lis. 19-26).

31. Regarding claim 38, Lin discloses that the heat spreader comprises copper (col. 6/lis. 19-26).

32. Regarding claim 39, Lin discloses that the heat spreader comprises aluminum (col. 6/lis. 19-26).

33. Regarding claim 40, Lin discloses that the heat spreader is electrically conductive (col. 6/lls. 19-26).

34. Regarding claim 41 (as understood), Lin discloses an encapsulant material 28 that encapsulates the IC die and the heat spreader on the second surface of the stiffener.

35. Regarding claim 42, Lin teaches that the stiffener is a second heat spreader (abstract).

36. Regarding claim 45, Lin teaches that the encapsulant material is used to maintain the heat spreader in contact with the second surface of the IC die.

37. Regarding claim 46, Lin teaches that the encapsulant material that encapsulates the IC die and a portion of the heat spreader on the second surface of the stiffener.

38. Regarding claim 47, Lin shows that a substantially planar surface of the heat spreader is not encapsulated by the encapsulant material and is accessible.

***Claim Rejections - 35 USC § 103***

39. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

40. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

41. Claims 4, 6, 7 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 6,184,580) in view of Huang (US 2001/0045644 A1).

42. Regarding claim 4, Lin shows that the die surface includes contact pads and wires. However, Lin does not disclose a wire bond that couples the contact pad to the heat spreader. Hung (e.g. 4) teaches a semiconductor package having contact pads connected to a heat spreader 250 by a wire bond 238a. Moreover, Hung discloses that the heat sink is grounded by a wire bond in order to provide a better electrical performance [0025]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a wire bond to couples the contact pads and the heat spreader of Lin, in order to provide better electrical performance as taught by Hung.

43. Regarding claim 6, Lin discloses that the contact pads are ground pads. Also, the heat spreader operates as a ground plane (6/lls. 1-18).

44. Regarding claim 7, Lin shows that the planar heat spreader 42 has a ridge 44a, a first surface 43 parallel to a second planar surface 44' (see attachment fig. 3). As shown in figure 3, the first planar surface is greater than the second planar surface. Lin does not explicitly disclose a circumferential surface. Nonetheless, this limitation,

absent any criticality, is only considered to be an obvious modification of the shape of the projection surface disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See In re Dailey, 149 USPQ 47 (CCPA 1976).

45. Regarding claim 20, the device of claim 4 would necessary have to be formed in order to function. Claim 20 fails to further limit the device of claim 4 other than simply form each of their component.

46. Regarding claim 21, the device of claim 5 would necessary have to be formed in order to function. Claim 21 fails to further limit the device of claim 5 other than simply form each of their component.

47. Regarding claim 22, the device of claim 6 would necessary have to be formed in order to function. Claim 22 fails to further limit the device of claim 6 other than simply form each of their component.

48. Regarding claim 23, the device of claim 7 would necessary have to be formed in order to function. Claim 23 fails to further limit the device of claim 7 other than simply form each of their component.

49. Claims 11, 15, 28, 32 and 48-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 6,184,580).

50. Regarding claim 11, Lin shows that the IC die is mounted to the stiffener with a first attaching means (col. 4/lis. 3-5). Also, the heat spreader is mounted to the IC die with a second attaching means 28 (e.g. fig. 3). The second attaching means is an epoxy (col. 4/lis. 60-62). Lin discloses that conductive paste or insulating paste can be used as a first attaching means. Official Notice is taken with respect to the use of an epoxy as a first attaching means since it is very well known in the art to use epoxies as conductive or insulating pastes. Thus, to mount the IC on the stiffener using an epoxy would have been obvious to a person having ordinary skill in the art at the time the invention was made since epoxies are very well known types of conductive or insulating pastes commonly used in the art.

51. Regarding claim 15, Lin shows most aspect of the instant invention including a surface 44 between the first and second heat spreader surfaces. Also, this surface is partially exposed (the side wall of the projection 44). Lin does not explicitly disclose that the surface 44 is a circumferential surface. Nonetheless, this limitation, absent any criticality, is only considered to be an obvious modification of the shape of the projection surface disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See In re Dailey, 149 USPQ 47 (CCPA 1976).

52. Regarding claim 28, the device of claim 11 would necessary have to be formed in order to function. Claim 28 fails to further limit the device of claim 11 other than simply form each of their component.

53. Regarding claim 32, the device of claim 15 would necessary have to be formed in order to function. Claim 32 fails to further limit the device of claim 15 other than simply form each of their component.

54. Regarding claim 48, Lin shows the heat spreader includes opposing first and second surfaces, and further includes a projection surface between the first and second surfaces of the heat spreader, wherein the first surface of the heat spreader is attached to the second surface of the die surface, wherein the second surface of the heat spreader and a portion of the lateral surface are not encapsulated by the encapsulant material and are accessible. However, Lin does not explicitly teach that the projection surface of the heat spreader is circumferential. Nonetheless, this limitation, absent any criticality, is only considered to be an obvious modification of the shape of the projection surface disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See In re Dailey, 149 USPQ 47 (CCPA 1976).

55. Regarding claim 49, Lin shows that the heat spreader includes a first surface of attached to the second surface of the IC die, a second opposed to the first surface of

the heat spreader and having an area larger than an area of the first surface. Also, Lin shows a lateral surface around the heat spreader that connects the first and second surfaces, and a ridge 44a opposed to the second surface of formed between the first and second surfaces in the lateral surface. Lin does not explicitly disclose that the lateral surface is circumferential and a second surface having an area less than an area of the first surface. Nonetheless, this limitation, absent any criticality, is only considered to be an obvious modification of the shape of the heat spreader disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See In re Dailey, 149 USPQ 47 (CCPA 1976).

56. Regarding claim 50, Lin shows that the heat spreader is defined by an opposing first and second surfaces, wherein the first surface is attached to the second surface of the IC die. Lin does not explicitly teach that the heat spreader is substantially rectangular in shape. Nonetheless, this limitation, absent any criticality, is only considered to be an obvious modification of the shape of the heat spreader disclosed by Prior Art as the courts have held that a change in shape or configuration, without any criticality, is within the level of skill in the art as the particular shape claimed by applicant is nothing more than one of numerous shapes that a person having ordinary skill in the art will find obvious to provide using routine experimentation based on its suitability for the intended use of the invention. See In re Dailey, 149 USPQ 47 (CCPA 1976).

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57. Regarding claim 51, Lin teaches that the second surface of the heat spreader is capable of being attached to a contact area on a printed circuit board when the BGA is mounted to the printed circuit board

58. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (US 6,184,580) in view of Lewis et al. (US 4,611,238)

59. Regarding claims 43 and 44, Lin discloses a heat spreader attached to the second surface of the IC die. Lin does not explicitly teach that the heat spreader is attached by a thermally and electrically conductive adhesive. Lewis teaches that it is conventional to use a thermally and electrically conductive adhesive such as a solder to attach a heat sink and an IC chip (col. 1/lis. 57-64). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a thermally and electrically conductive adhesive such as a solder to attach the heat spreader and the IC chip disclosed by Lin because this type of attachment is conventional as taught by Lewis.

#### ***Allowable Subject Matter***

60. Claims 52 and 53 are allowed.

61. Claims 8 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Remarks***

62. Regarding claims 18-34, the recitation "a method of forming..." has not been given patentable weight because the recitation occurs in the preamble. A preamble is

generally not accorded any patentable weight where it merely recites the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, structural limitations are able to stand-alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

### ***Response to Arguments***

63. Applicant's arguments filed 06/26/2002 have been fully considered but they are not persuasive.

64. Applicant argues that Lin does not teach a stiffener attached to a first surface of the substrate because they are not directly coupled together or in physical contact. Nonetheless, the claim does not specify that stiffener is directly attached to first surface of the substrate or in physical contact. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is respectfully noted that Lin (e.g. 4) clearly shows that the stiffener 26 is attached to the first surface of the substrate 35 by the sandwiched structure 36-40. In another interpretation the whole sandwiched structure 35-40 can be recognized as "a substrate". In this case, the stiffener is directly coupled to the first surface of the "substrate".

### ***Conclusion***

65. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

66. Papers related to this application may be submitted directly to Art Unit 2826 by facsimile transmission. Papers should be faxed to Art Unit 2826 via the Art Unit 2826 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2826 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2826 Fax Center is to be used only for papers related to Art Unit 2814 applications.

67. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Leonardo Andújar** at **(703) 308-0080** and between the hours of 9:00 AM to 5:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via [Leonardo.Andujar@uspto.gov](mailto:Leonardo.Andujar@uspto.gov). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn, can be reached on (703) 308-6601.

68. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 305-3900**.

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69. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass (es): 257/706, 707, 717 and 737	07/03
Other Documentation:	
Electronic Database(s): East (USPAT, US PG PUB, JPO, EPO, Derwent, IBM TDB)	07/03

**Leonardo Andújar**

Patent Examiner Art Unit 2826

LA

7/2/03